

Different Ergogenic Aids: Claims versus Reality

-by Trent Stellingwerff-

In continuation of the last Running Room magazine issue, which looked at the makings of a good sports drink, this article is an informative guide that you as a consumer can use when being bombarded with the incredible market proliferation of pills, foods, vitamins, creams, and potions. Like the sports drink market, over the last five to 10 years there has been an incredible increase in the number of items that you can purchase that claim to be ergogenic or performance enhancing. Also similar to the sports drink market, many of these products simply don't work or can't physiologically work- which many times is against the claim of its producer. The goal of this article is to provide you with enough information so you can make educated decisions the next time someone wishes to sell you the next "magic bullet."

The Role of Science in Assessing the Effectiveness of New Products

Like the sports drink article, the primary hurdle that scientists have with the sports nutrition and nutraceutical market is the major increase and proliferation of available ergogenic products that has far outstripped the scientific communities ability to test for actual ergogenic effects or *claims* of such products. An ergogenic aid is any substance or phenomena *believed* to increase performance. An ergogenic aid can range from carbohydrate loading, to illegal substances such as steroids, to simply having a good warm-up. The crux of this situation is that research needs to be completed by an unbiased, outside source, in well established and controlled laboratory setting using well established methods and then published in a peer-reviewed scientific journal to be truly valid. It can take years for a laboratory to accurately assess the efficacy of one single new product. Then, the results for this new product should even be confirmed by another lab to be truly believable. Many times the *claims* of some products don't undergo this rigorous process. Sometimes, the company that produces the product itself assesses them, which is obviously a major conflict of interest! Below are just some of the issues and variables that scientists face.

- Subject/person- may only be effective in untrained vs. trained people or vice versa
- Type of exercise- item may only work in power or speed events and not endurance or vice versa
- Amount- too little or too much of the product may show no effect
- Use- acute (short term) may show effect, but if used chronically may be compromising to health
- Is it degraded (absorbed or broken down) in the stomach? The stomach is very acidic and most items are degraded and changed before they even reach the intestines (where absorption occurs) or to the muscles.
- Can it be measured in the blood and even absorbed by the target organ? (ie. if something is claimed to work in the muscles, can it even get there via the blood and then be absorbed and taken up by the muscle.

Now you can appreciate why there are so many controversies and misunderstandings in the world of nutrition and sport performance: there are just so many variables to evaluate.

The Low-Down on Energy Drinks

In continuation from the last article on Sports Drinks, the rule of thumb during exercise is to take in fluids and nutrition that your body needs during exercise, not extra items that may interfere with absorption and potentially cause stomach upset. There has been an explosion of energy drinks over the past several years and many of these drinks contain too many ingredients and sugar for optimal fluid absorption during exercise. Many are simply over concentrated. Some of these drinks that contain extra sugar, vitamins and amino acids, could be more effective during recovery and regeneration, but cost around \$3 each. It is actually much cheaper to get these same items from a well-balanced meal. Of course, these drinks are portable and therefore are great if you can't eat immediately after a hard workout or race. Nevertheless, the consumer should ask oneself the following questions when considering a new energy drink or a new product:

- Does the new product or 'energy drink' sound too good to be true?- Then it probably is!
- Does it have a nutritional or supplement ingredient list? If not, don't even consider using it as some products have been found to contain banned substances.
- Is there well-controlled, un-biased research that is published in a credible science journal on this product?
- Does it contain too much of an ingredient that would cause a negative performance effect?. (ie. too much carbohydrate or too much caffeine)

- Could you get everything in the drink from your normal diet, without the added cost?
- Does it contain herbs? Herbs have little or no regulatory control and have a potential for serious side effects if taken with other prescribed medicine.
- Finally, is your current training, eating and lifestyle patterns already optimized for performance? Why spend money on expensive energy drinks when you can make some easy, cost effective improvements first.

Many of the Items ‘Claimed’ to be Ergogenic Performance Enhancing¹

Below is a technical list that includes both the trade and science names of many products that claim to increase performance¹. To be clear, many of the vitamins and minerals listed below are absolutely vital in a normal, healthy diet for optimal health and to prevent deficiencies. But, if you already eat a healthy mixed diet, and have no deficiencies, many of these items won't increase performance as potentially claimed. Alternatively, if you eat a healthy diet, you will already be accomplishing the RDA (Recommended Daily Allowance) for many of these items in what you eat. So, it doesn't make much sense to spend extra money purchasing them.

Antioxidants: (Ascorbic Acid-Vit C (300 to 500mg/day) & Tocopherols- Vit E (400-800 IU/day))

- Generation of free radicals is a normal part of life, but increases during intense and long exercise. Free radicals can adversely alter and damage biological structures.
- Antioxidants “may” help in protecting against free radical damage during intense exercise, but supplementation cannot be expected to improve aerobic performance.

B Complex Vitamins: (Thiamin- Vit B1 (0.5mg/1000 kcal), Riboflavin- Vit B2 (0.6mg/1000kcal), Niacin or Nicotinic Acid- Vit B3 (6.6mg/1000kcal), Pyridoxine or Pyridoxal- Vit B6 (2mg/day), Cobalamins- Vit B12 (3ug/day), Folic Acid (0.4mg/day), Pantothenic Acid (4-7mg/day) & Biotin (100-300ug/day)

- Most B complex vitamins are involved with the metabolism of food, producing energy, and thus have attracted interest as potential ergogenic aids
- Administration of individual B vitamins showed NO ergogenic effect unless very large doses were given, but are possibly unsafe in large doses over time
- Supplementation in mixtures may have more of an ergogenic effect, but again, very large doses are needed for a response and not always seen in the studies
- Found in diet: pork, milk, animal products, egg yolks, leafy greens, legumes, and many breads and enriched cereals.

Bicarbonates: (baking soda dose of 0.2-0.3g/kg = 14-21g for 70kg person!) Therefore, one needs at least 14-21g to get an effect, which is a lot to take in.

- Acidosis (decreases in pH caused by lactate increases) in muscles is one major factor causing fatigue. Bicarbonate ions are the chief buffering system of the body that reduces acidosis during intense exercise.
- Bicarbonate loading is useless for endurance effects and is not recommended for efforts lasting longer than 3 to 5 minutes.
- Although bicarbonate loading is a well-supported ergogenic aid when used under the appropriate circumstances, the dosage needed to achieve a performance increase causes major stomach and gastrointestinal upset

Caffeine: (methylxanthine- dosing: 3 to 5mg/kg body weight 1 hr before exercise)

- Caffeine is able to stimulate the central nervous system, neurons, and adrenaline release, as well as increase serum free fatty acid levels, thus sparing stored glycogen (glucose)
- A large number of studies have found significant increase in exercise performance for events over 1 hr, including increased time until exhaustion, total work performed and decreased time for a time trial. Not as effective if habituated to caffeine, and works more effectively with pure capsule form instead of coffee.
- Should be aware that caffeine can dehydrate you, so take in extra water to replace urine losses

L-Carnitine and Coenzyme Q10 (Ubiquinone):

- No effects with acute supplementation, but “possible” endurance performance effects with chronic supplementation (for over 1 month). More studies needed on chronic supplementation, but outcomes are doubtful.

Other Substances Marketed as Ergogenic Aids with NO effect:

Chromium (200ug/day), Ginseng (1g/day), Magnesium (40-100mg/day), Boron (3mg/day), Methyl donors (dimethylglycine, pangamate, lecithin, choline- 100-200mg/day), Nucleotides (Inosine-3-6g/day),

Octacosanol (Wheat Germ Oil- 1000ug/day), Phosphates (1-10ug/day), Pollen (~2000mg/day), Vitamins A, D & K (fat soluble- possible toxicity effects)

- Most substances above still need more research in both acute and chronic supplementation effects. Some “might” show ergogenic effects; however, some of these effects may be hidden in the fact that the ergogenic results may just be the repletion of deficient states.

Protein and Amino Acids:

- Recent studies have shown that endurance athletes (~1.5-g/ kg BW/ day) may actually need more protein than sedentary individuals (~0.8g/ kg BW /day). (see the July/August 2004 Issue for more information on protein and runners).

- But, most non-vegetarians easily accomplish their protein and amino acids needs in their normal diet, therefore, supplementation is normally unnecessary.

Final Take Home Message

Many of these new products haven't yet been scientifically tested. Therefore, most times the easiest and cheapest ergogenic aid that I can recommend is sound and consistent training with a well balanced diet. Also, utilizing many of the basic nutrition and hydration recommendations that I have presented in previous articles for before, during and after exercise will be your most effective and worth-while strategy.

Trent Stellingwerff is a PhD Candidate in the Dept. of Human Biology and Nutritional Sciences at the Univ. of Guelph where he was a two-time 'All-Canadian' in distance running. Prior to Guelph, Trent graduated from Cornell Univ. in 2000 with a Hon. BSc in Nutrition and Exercise Physiology, while captaining the track and field team in his last year. Currently, Trent works part time at the Univ. of Guelph Health and Performance Centre and is also a Level II certified distance assistant coach with the varsity Guelph team.

References

1. Sports Drinks: Basic Science and Practical Aspects. Editors: Ronald J. Maughan and Robert Murray. *Nutrition in Exercise and Sport*. CRC Press, 2001.